WHAT IS CLAIMED IS:

1. An exhaust manifold comprising a ceramic inner layer having an inner wall surface defining an exhaust gas passageway of said manifold, a ceramic insulation layer disposed exterior to and adjacent said inner layer, and an outer structural layer disposed exterior to said insulation layer, wherein said ceramic inner layer is a slip cast layer.

2. An exhaust manifold according to claim 1, said ceramic insulation layer comprising ceramic fibers and ceramic filler material.

3. An exhaust manifold according to claim 1, said ceramic inner layer comprising fused silica.

4. An exhaust manifold according to claim 1, said ceramic inner layer being slip cast from a slip composition comprising at least 60 weight percent colloidal fused silica particles.

5. An exhaust manifold according to claim 1, said ceramic inner layer comprising a major amount of fused silica.

6. An exhaust manifold according to claim 1, said ceramic inner layer being slip cast from a slip composition comprising fused silica and no more than 5 weight percent fibers.

7. An exhaust manifold according to claim 1, said ceramic inner layer being made from a ceramic material having a highly amorphous structure, able to withstand thermal cycling from 25°C up to 800°C and back down to 25°C without cracking.

8. An exhaust manifold according to claim 1, wherein said inner layer is 0.05-5 mm thick.

9. An exhaust manifold according to claim 1, wherein said outer structural layer is made from aluminum.

10. An exhaust manifold according to claim 1, further comprising a strain isolation layer disposed between said insulation layer and said outer structural layer, wherein said strain isolation layer is a compliant layer effective to dampen unmatched thermal expansion between said outer structural layer and said insulation layer.

11. An exhaust manifold according to claim 10, said strain isolation layer being an

intumescent mat.

12. An exhaust manifold according to claim 11, said intumescent mat comprising an expandable material that expands on heating.

13. An exhaust manifold according to claim 12, said expandable material being vermiculate, perlite or a combination thereof.

14. An exhaust manifold according to claim 12, said expandable material being in the form of embedded particles of vermiculite, perlite, or a combination thereof, dispersed throughout the intumescent mat.

15. An exhaust manifold according to claim 11, said intumescent mat comprising, by weight, 20-60 percent ceramic fibers, 35-75 percent expandable material, balance ceramic filler and/or binder material, wherein the expandable material is vermiculate, perlite or a combination thereof.

16. An exhaust manifold according to claim 11, said intumescent mat being expandable on heating and contractible on cooling thereof.

17. An exhaust manifold according to claim 1, said manifold being water cooled.

18. An exhaust manifold comprising a ceramic inner layer having an inner wall surface defining an exhaust gas passageway of said manifold, said ceramic inner layer comprising a major amount of fused silica.

19. An exhaust manifold according to claim 18, said ceramic inner layer being slip cast from a slip composition comprising fused silica and no more than 5 weight percent fibers.

20. An exhaust manifold according to claim 18, said inner wall surface having a surface grain roughness less than 100 μm.

21. An exhaust manifold according to claim 18, said inner wall surface having a surface grain roughness less than 10 μm.

22. A method of making an exhaust manifold comprising slip casting a ceramic inner layer of said manifold from a slip composition comprising a major amount of fused silica

particles and no more than 5 weight percent fibers.

23. A method according to claim 22, further comprising firing the slip cast ceramic inner layer to harden said inner layer, coating an outer surface of said ceramic inner layer with a ceramic filler/fiber material composition to provide a ceramic insulation layer thereover, and refiring to form a finished composite comprising concentric ceramic insulation and inner layers.

24. A method according to claim 23, further comprising using said composite as a core member in a sand mold, such that an inner surface of said mold and an outer surface of the composite define a gap therebetween to accommodate a metallic outer layer to be cast, pouring molten metal into said gap, and allowing said molten metal to cool thereby casting the metallic outer layer around said composite.

25. A method according to claim 23, further comprising providing an outer structural layer as two clamshell halves, placing said composite within the volume of one of the clamshell halves, and fitting the other clamshell half thereover, thereby enclosing said composite within said outer structural layer to form said manifold.

26. A method according to claim 25, further comprising fastening said clamshell halves to one another along cooperating split-line flanges provided and extending adjacently around an open end perimeter of each of the outer layer clamshell halves.

27. An exhaust manifold according to claim 1, further comprising a catalyst support body disposed within said exhaust gas passageway of said manifold, said catalyst support body having a catalyst material disposed on a surface thereof.

28. An exhaust manifold according to claim 27, said catalyst material being selected from the group consisting of: a) palladium-containing catalyst materials; b) platinum-containing catalyst materials; c) perovskite catalysts having the form ABO_x where A is a rare earth element or an alkaline earth element, and B is a transition metal element; and d) fluorite catalysts having the form ABO_x where A is a rare earth element and B is Ce or Zr.

29. An exhaust manifold according to claim 1, said ceramic inner layer comprising a catalyst effective to convert at least a portion of CO and NO_x in an exhaust gas flowing through said exhaust gas passageway to CO_2 and N_2 and O_2 respectively.

30. An exhaust manifold according to claim 18, further comprising a catalyst support body disposed within said exhaust gas passageway of said manifold, said catalyst support body having a catalyst material disposed on a surface thereof.

31. An exhaust manifold according to claim 30, further comprising a damping layer or ring disposed between said catalyst support body and said inner wall surface of said ceramic inner layer, said damping layer or ring being effective to compensate for or dampen unmatched thermal expansion characteristics between said outer structural layer and said catalyst support body.

32. An exhaust manifold comprising a ceramic inner layer defining an exhaust gas passageway of said manifold, said ceramic inner layer being made from a material that is highly resistant to thermal shock from thermal cycling of said manifold between ambient temperature and 500°C.

33. An exhaust manifold comprising a ceramic inner layer defining an exhaust gas passageway of said manifold, said ceramic inner layer comprising a catalyst effective to convert at least a portion of CO and NO_x in an exhaust gas flowing through said exhaust gas passageway to CO_2, and N_2 and O_2 respectively.

34. An exhaust manifold according to claim 33, further comprising a ceramic insulation layer disposed exterior to and adjacent said inner layer, and an outer structural layer disposed exterior to said insulation layer.

35. An exhaust manifold comprising a substantially ceramic integrated layer defining an exhaust gas passageway of said manifold, and an outer structural layer disposed exterior to said integrated layer, wherein said integrated layer comprises ceramic fibers and ceramic filler material, wherein said integrated layer has a radial porosity gradient such that localized porosity increases in an outward radial direction therein.

36. An exhaust manifold according to claim 35, wherein the localized porosity at an interior wall of said integrated layer is less than 5%, and the localized porosity at an outer surface thereof is 20-95%.

37. A method of making an integrated layer having a radial porosity gradient comprising the steps of:

a) providing a plurality of aqueous slurries, each of said slurries comprising a solids mixture of ceramic fibers and ceramic filler material and said slurries having incrementally increasing filler:fiber ratios;

b) vacuum forming said integrated layer by successively introducing said slurries into a vacuum formation process to provide an integrated layer having a radial porosity gradient.